APPENDIX 8.1F

Evaluation of Best Available Control Technology

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To evaluate BACT for the proposed turbine, the guidelines for large simple cycle gas turbines (> 50 MW) as delineated in the District, state, and federal BACT listings were reviewed. The relevant BACT determinations for this analysis are shown in the following tables.

TABLE 8.1F-1
SCAQMD BACT Data for Simple Cycle Gas Turbines

Pollutant	BACT	Typical Technology
Nitrogen Oxides	5 ppm dry @ 15% O_2, 1 or 3 hr avg	1. SCR + DLN, or, 2. SCR + water or steam injection
Sulfur Dioxide	Natural gas fuel	PUC regulated gas
Carbon Monoxide	6 ppm dry @ 15% O_2, 1 or 3 hr avg	Catalytic oxidation
VOC	2 ppm dry @ 15% O_2	Catalytic oxidation
PM_{10}	Natural gas fuel	PUC regulated gas

Achieved in practice, from website August 2005

TABLE 8.1F-2
SCAQMD Recent BACT Decisions for Simple Cycle Gas Turbines (achieved in practice)

Facility	NO_x	CO	VOC	PM_{10}/SO_x
Colton	3.5*	6	2	Natural gas
Indigo	5	6	2	Natural gas
LADWP-Valley	5	6	2	Natural gas

Ammonia slip BACT is 5 ppmv for all listings. SCR for NOx all listings. CO catalyst for CO and VOC all listings.
* Dated 2-17-04, applicant proposed 3.5 ppm NOx, while AQMD states 5 ppm NOx is BACT/LAER
From SCAQMD website, August 2005.

TABLE 8.1F-3
Summary of BACT Recommendations from ARB-CEC BACT Guidance (SImple Cycle)*

NO_X	CO	VOC	SO_X	PM_{10}
5 ppm dry @15% O_2,	6 ppm dry @15% O_2	2 ppm dry @ 15% O_2	Natural Gas Fuel	Natural Gas Fuel
3 hr avg	3 hr avg	3 hr avg	Fuel S< 1gr/100 scf	
5 ppm NH3 slip				
@ 15% O_2				

* CARB, July 1999.

TABLE 8.1F-4
Recent Facility BACT Determinations for Large Simple Cycle Gas Turbines

Facility/Location	NO_X	CO	VOC	PM_{10}/SO_X
GWF Tracy	5 ppm	6 ppm	2 ppm	Natural gas
Enpower Corp. CPA Peaker Analysis*	5-8 ppm	6-10 ppm	2-3 ppm	Natural gas
Henrietta Peakers	3.6 ppm	6 ppm	2 ppm	Natural gas
Los Esteros	5 ppm	6 ppm	2 ppm	Natural gas
Calpeak-Enterprise	5 ppm	6 ppm	2 ppm	Natural gas
Calpeak-Border	5 ppm	6 ppm	2 ppm	Natural gas
RAMCO	5 ppm	6 ppm	2 ppm	Natural gas

* Not a public domain document.

The USEPA RACT-BACT-LAER Clearinghouse (RBLC) was also consulted to review recent USEPA BACT decisions for simple cycle gas-fired gas turbines. These recent BACT decisions are summarized in Table 8.1F-5.

TABLE 8.1F-5
Simple Cycle Turbine RBLC BACT Determinations (Natural Gas)

RBLC ID	Unit Size, mmbtu/hr	NOx ppm	CO ppm	VOC ppm
CA0997	1611	2	4	1.4
VA0263	1624	10.5	9	
VA0266	1624	9	9	
VA0262	866	9	51	2.6
VA0261	2132		2	1.7
IA0060		3	5	
SC0064	1751	2.5	14	

TABLE 8.1F-5
Simple Cycle Turbine RBLC BACT Determinations (Natural Gas)

RBLC ID	Unit Size, mmbtu/hr	NOx ppm	CO ppm	VOC ppm
OK0072	1832	3.5	17.2	
VA0250	1887	2.5		
FL0232	1591	25	10	
IN0095	469	25	25	
MI0327	1679	15		
CA0593	412	5	6	2
MI0296	855	9	25	
IN0096	1146	9	25	
FL0227	1803	9	7.4	1.4
FL0229	1910	9	9	1.4
MI0321	849	9	25	
CA0951	464	5	6	2
SC0058	3296	3.5	11.7	3.5
AR0042	6077	3.5	7	
NM0043	1500	9	9	7
Average	**-**	**8.5**	**13.9**	**2.55**
Range	**412 - 6077**	**2 -25**	**2 - 51**	**1.4 - 7**

BA recent compilation of BACT determinations is presented in AWMA Paper #42752 (June 2002), "Comparison of the Most Recent BACT Determinations for Combustion Turbines by State Air Pollution Control Agencies". Data presented in this paper was derived from surveys conducted nationwide. Simple cycle BACT data is summarized as follows:

NO_x	5-12 ppm
CO	9-25 ppm
VOC	No Data
PM_{10}	Nat gas fuel
SO_2	Nat gas fuel

Based on the above data, it would seem that the most appropriate and current range for BACT for simple cycle combustion turbines (achieved in practice) is as follows:

NO_x	5 ppm	(DLN, DLN+SCR, SCR + water/steam injection)
CO	6 ppm	(good combustion practices (GCP), GCP + CO catalyst)
VOC	2 ppm	(good combustion practices (GCP), GCP + CO catalyst)
PM_{10}	Nat gas fuel	(clean fuel)
SO_x	Nat gas fuel	(clean fuel)

Cooling Tower BACT

BACT for the cooling tower is the use of high efficiency drift eliminators at a rating or 0.0005%.

Diesel Fired IC Engine BACT

BACT levels for the diesel fired fire pump engine are as follows:

TABLE 8.1F-6
Summary of BACT Recommendations from SCAQMDGuidance for Diesel Fired Fire Pump Engines

	NOx, g/bhp	CO, g/bhp	VOC, g/bhp	SOx, %S wt.	PM10, g/bhp
Fire Pump Engines	3.9 – 6.9	0.45 – 8.5	0.09 – 1.0	<=0.05	0.14 – 0.38

The proposed diesel engine will also comply with the EPA Tier II and/or Tier III standards as applicable based upon engine size and year of manufacture.

The proposed diesel engine will comply with the CARB proposed Air Toxic Control Measure (ACTM) for Stationary Compression Ignition Engines (upon adoption by the South Coast AQMD). Since the fire pump engine is classified as emergency standby, with a rating greater than 50 hp, and operational hours less than 100 hours per year, the performance standard to be met will be 0.1g/hp-hr using CARB certified diesel fuel. Add-on controls would not be required, and a HRA would also not be required. In addition the engine will comply with AQMD Rule 1470 and the Tier standards as delineated in Title 13 CCR Section 2423, based upon engine size and year of manufacture.

Table 8.1F-7 SCR Design Data

Table 8.1F-8 CO Catalyst Design Data

Table 8.1F-7 SCR Design Data

SCR CATALYST SYSTEM SPECIFICATIONS FOR GE AERO ENERGY PRODUCTS

Please Specify	Description	Units
Lead Time Required	< 4 months / must confirm manufacturing availability	
Guaranteed Life	Earliest of 20,000 hours from first gas-in or 51 months from Contracted Delivery	op. hours
Expected Life @ 800 °F	> 20,000 hours	op. hours
Catalyst Module Dimensions	133.5"W x 81.5"H x 24"D	feet
Total Catalyst Dimensions	22.25'W x 34'H x 2.5'D	feet
Module Weight and Total Weight	4,600 / 46,000 total	pounds
Catalyst Volume	Approx. 27 m3	ft^3
Space Velocity	23,580	1/hr *
Max. Operating Temperature	870°F - Continuous 930°F – limited to 500hrs total or 1020 °F limited to 4 hrs total.	°F
Pressure Drop (guar/exp)	4.8/4.3	in H_2O
Percent Open Area to Flow	> 78	%
Catalyst Pitch	2.1	mm
Geometric Surface Area	> 1670	m^2/m^3
BET Surface Area	Proprietary	m^2/g
Cell Density and Geometry	70 cell product (approx 144cpsi)	cpsi
SO_2 to SO_3 Conversion	< 2.5%	%
Major Contaminants and Maximum Contaminant Levels	See Catalyst Degradation Chart	

GHSV in ft^3/hr gas @ STP / ft^3 catalyst

ENGELHARD

Engelhard Corporation
101 Wood Avenue, P.O. Box 770
Iselin, NJ 08830-0770
732-205-5000

Table 8.1F-8 CO Catalyst Design Data

Engelhard Corporation
2205 Chequers Court
Bel Air, MD 21015
410-569-0297
e-mail: fred_booth@engelhard.com

DATE: August 11, 2005 **NO. PAGES** 1

TO: EXPRESS INTEGRATED TECHNOLOGIES via e-mail
ATTN: Phil Childers

FROM: Fred Booth **Ph 410-569-0297 // FAX 410-569-1841**

RE: EIT C05-115
GE – LMS100 // SoCalEd Project
CO Catalyst – Engelhard Proposal EPB00262-Rev. 1a - Data Sheet

Design and Construction Details	CO
Catalyst material	Pt on ALUMINA
Catalyst manufactured by	ENGELHARD
Number of catalyst layers	1
Total number of modules	LATER
Catalyst Module length x width x height (ft)	Nom. 2 ft x 2 ft x 2.5 in.
Include room for a spare layer	YES
Catalyst module cells per sq in.	140
Catalyst space volume {ratio of gas volume (ft3/hr) and catalyst volume in service (ft3)}	Nom. 120,000 Max.
a) Catalyst conversion efficiency %	See Proposal –
b) Catalyst efficiency after 10000 hours of operation	See Proposal –
Catalyst washing requirements	DE-ION WATER
The maximum temp. catalyst can withstand 0F	1250
Minimum operating catalyst temperature 0F	500
Over temperature protection for catalyst	
Differential pressure protection	
Exhaust gas face velocity through catalyst housing, fps	Nom. 24
Ammonia Injection Grid (AIG)	N/A
Number of headers	N/A
Branches per header	N/A
AIG pipes total	N/A
Ammonia Flow Control Skid	N/A
Number of blowers / fans provided	N/A
Atomizing air requirements (CFM)	N/A
How is the ammonia injection skid controls interfaced with plant controls?	N/A
Catalyst support frame / structure	
Number of test elements provided for each layer of catalyst	8
List of catalyst poisons and operating conditions that may reduce the life of catalyst.	SEE WARRANTY
Catalyst life, (operating hours)	20,000
Pressure drop, (In of WC)	1.9"wg Max.
Lifting equipment and tools	N / R
At design operating conditions, estimated ammonia consumption, lb/hr	N/A
Will the catalyst supplier accept spent catalyst for disposal?	YES
Type of gaskets used	Zetex Rope